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Developing professional recognition of systems thinking in practice

(Updated)¹ interim report on developing a Systems Thinking in Practice Competency Framework

Rupesh Shah and Martin Reynolds²

1. Introduction

This interim report on developing a competency framework for systems thinking in practice (STiP) provides a step towards possibly developing professional recognition of STiP. The report provides feedback to initial co-respondents involved with phase 1 of this wider inquiry, and aims to act as a platform for initiating a second phase of the inquiry.

The phase 1 study had the following objectives:

1. To scope relevant examples of work aimed at giving professional recognition to systems thinking
2. To capture some perspectives on the challenges and opportunities facing the task of giving profession recognition to systems thinking.

Phase 2 of the wider inquiry aims to firstly consolidate the findings from phase 1 but also to focus more on moves towards collaborative modelling of a STiP competency framework.

The research is being carried out by members of the Applied Systems Thinking in Practice (ASTiP) Group at The Open University (UK) with funding from OU eSTeEM (OU Centre for STEM Pedagogy). The research team for phase 1 comprised of Rupesh Shah (Associate Lecturer), who carried out the core research activities, in collaboration with Martin Reynolds (Senior Lecturer) who is overseeing both phases of the wider inquiry, including support for reporting on research outcomes. The findings reported in sections 4, 5 and 6 remain largely unrefined and in sketch (bullet) form at this interim stage of reporting.

The interim report comprises a brief background to the wider inquiry before outlining the approach taken to the phase 1 study. The findings are reported in relation to each of the two study objectives. Three themes arising from the study as identified by Rupesh are then discussed. Finally, some concluding ideas are presented for taking forward the outcomes from this study towards a second phase of the inquiry.

2. Background

The notion of competency has emerged over the last 20 to 30 years in relation to education, management and development of professional practice (Gonczi 1994) and their use across a range of professions has grown considerably (Lester 2014). Competency frameworks offer structured description of the skills, knowledge and abilities required to perform a role and are generally used for 'entry' level professionals, providing them license to operate within the profession. Competency frameworks are also sometimes promoted and designed to cultivate professional recognition as an approach to governance, assessment and development.

¹ Revised 2nd June 2017 from original draft, February 2017. Updates apply principally to Section 7 of the report in further iterating on phase two of the inquiry.

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Systems thinking in practice (STiP) is the namesake of a set of postgraduate qualifications developed by the Open University since 2010.³⁴ The term is adopted throughout this study, and wider inquiry, to encapsulate the essential praxis (theory-informed-action) underpinning systems thinking (thinking in practice) interventions. The inquiry into developing a STiP competency framework arises from an earlier inquiry (2014-2016) undertaken by the Applied Systems Thinking in Practice (ASTiP) Group at the Open University, also with funding from OU eSTeEM (OU Centre for STEM Pedagogy). The final report of the eSTeEM project - [Enhancing Systems Thinking in Practice at the Workplace](#) (Reynolds et al, 2016) generated challenges of applying STiP at the workplace. One significant challenge expressed in the inquiry by STiP alumni, as well as employers and other commissioners of STiP skills, was the absence of any formalized professional recognition of the skill-set associated with STiP. The absence is in paradoxical contrast to increasing calls in the media, politics, and a range of professions themselves, of a need for systems thinking to counter existing impoverished practices of managing prevailing complex situations of change and uncertainty. Findings from the eSTeEM project inquiry secured follow-up funding to enable ASTiP to explore what might comprise a STiP competency framework and how such a framework might be developed with active involvement of systems thinking practitioners, employers, and other stakeholders relevant to the workplace.

Phase 1 of this follow-up inquiry is essentially a scoping study – the gathering of a ‘rich picture’ depicting what is currently being undertaken with respect to ideas and initiatives on competency frameworks for systems thinking, and what perspectives and conflicts may be evident in the current situation. Phase 2 will be more associated in working with others in developing a model of STiP competency based on systemic desirability and cultural feasibility.

3. Approach to phase 1

The phase 1 study has two main strands taking place between November 2015 and May 2016:

1. desktop review of systems thinking competency across different professions;
2. conversations with some prominent players associated with systems thinking competency.

The desktop review located examples of activity regarding the professional recognition of systems thinking or examples that may be of interest to designers of such a framework. Conversations raised issues around developing a professional recognition in order to enhance demand for systems thinking and practice. Six conversations were arranged during Spring 2016 (list of participants in Acknowledgements) .

In addition to this a number of other informal conversations took place with colleagues from the eSTeEM team and other systems professionals (for example during the International Society for Systems Sciences Conference in Berlin 2015).

The high level framing for both strands is captured by the following question:

How might the development and implementation of a competency framework contribute to enhancing the professional recognition of systems thinking in practice?

³ See Open University website <http://www.open.ac.uk/choose/ou/systemsthinking>

4. Findings-1: relevant work on framing systems thinking competence

4.1 Overview

The core findings are presented as two alphabetical listings. The first provides a list of some initiatives already underway towards establishing some kind of competency framing in recognition of systems thinking skills. The second listing provides some examples of competency frameworks used in other professional areas, along with some brief notations on points of relevance.

Both listings can be regarded as ‘work in progress’. They are therefore presented in the format of a Wiki list. If regarded as being helpful, the intention is to possibly transfer these to an online format to which wider ongoing contributions might be made. A final subsection summarises some initial thoughts regarding possible tensions in framing systems thinking competence.

The references in italic numerals associated with items in both listings provide relevant URL links. The links are listed at the end of the document.

4.2 Repository of initiatives related to professional recognition of systems thinking

- College of Business Administration of the University of Talca and Bern University of Applied Sciences, Switzerlandⁱ
 - Competency framework for the learning and teaching of systems dynamics
 - Recent academic article focuses solely upon competences for systems dynamics
- CRR Globalⁱⁱ
 - Working with “systems oriented leadership” includes list of competences.
- Dawn of System Leadershipⁱⁱⁱ
 - Journal paper from Senge et al proposes three core capabilities that system leaders hold
 - The three capabilities are: “ability to see the larger system”, “fostering reflection and more generative conversations” and “shifting the collective focus from reactive problem solving to co-creating the future”.
- Forum for the Future^{iv}
 - System innovation lab list of competences for systems innovation.
- International Council on Systems Engineering
 - INCOSE UK Chapter statement on practice^v
 - Narrative description of systems thinking and generic qualities of those engaged in systems thinking.
- International Federation for Systems Research
 - 2016 IFSR Conversation. 3-8 April 2016, Linz, Austria. 2016 Conversations Theme of Systems Literacy introduced by Peter Tuddenham at the International Society for the Systems Sciences (ISSS) Annual Meeting in Berlin, Germany in August 2015.
- Isee systems

- Online discussion into value of certification programme for systems thinking^{vi}
- Wide ranging debate with some valuable insights regarding design challenges for an approach to recognition.
- Responsible Leadership Forum UK^{vii}
 - Research project to look at leadership capacities and organisational cultures & practices that support systemic change'.
- SCiO^{viii} (Systems and Complexity in Organisations)
 - Developing own competency framework for system thinking in 2016
 - Limited details available at present regarding the framework but ongoing conversations between Hoverstadt (SCiO) and Reynolds (OU) suggest synergies
- Systemic Leadership Tool Kit^{ix}
 - Includes 'competence for systems leadership'
- Systems Thinking World^x
 - Self paced programme offering certification as systems thinker
 - Basis for certification is unclear.
- Waters Foundation
 - Educational initiative, focused upon school curricula, provides a toolkit on the 14 'habits of a systems thinker'^{xi}
 - Uses framing of 'habits' compared with competences or capabilities.

4.3 Other relevant frameworks for professional recognition

- Applied Improvisation Network, Certified Practitioner^{xii}
 - Light touch model in terms of 'assessment requirements and processes of certification.
 - Some interesting approaches to dealing with the social aspect of certification.
 - There appears to be some awareness in the development of this model about the possible pitfalls at a higher system level of such a framework achieving universal acceptance.
- Consortium for Participatory Arts Learning^{xiii} A core competency framework for participatory arts
 - Relatively light touch framework in terms of content, approach to design and use in practice developed by a local consortium of practitioner organisations.

- Some sense of reflexive awareness that the framework is both not the territory and that use of the framework can be a trap for the wider field of professional practice.
- Makes use of visual elements in the document.
- Development was led by practitioner organisations (in contrast with some frameworks, particularly those taking an university-led or membership body-led.)
- European Association of Gestalt Psychotherapists - Professional Competencies and Quality Standards: Specific Competencies of Gestalt Therapists^{xiv}
 - Competences developed for gestalt psychotherapists. The framework is highly narrative in style. The framing of the document seems to have been important to the authors. The project seems to have begun in 2010/11.
 - There is a degree of reflexivity and awareness amongst designers of the limits of this approach. However, this awareness of limits and problems has been translated perhaps unfortunately into a lengthy framework document.
- International Association of Facilitators. Core competences of facilitators^{xv}
 - Core Facilitator Competencies framework
 - Developed over several years by groups of practitioners.
 - The framework presented on line is very brief and does not have much in the way of framing.
 - Separately, the International Association of Facilitators offers Certification based on the framework whereby someone needs to document their experience and must demonstrate both knowledge of, and skills in applying the Core Competencies.
 - There seems to be a limited amount of reflexivity in this framework.
- Organisational development: Competencies for human systems dynamics
 - An attempt by OD scholar G. Eoyang to define competences for organisational development practitioners drawing on the “ new sciences of nonlinear dynamics, chaos, and complexity.” (Eoyang, 2009)
- Systemic Family Therapy Competency framework^{xvi}
 - Quite lengthy and detailed in parts.
 - The framework for systemic therapy has two versions – one for clinicians and commissioners and another one for service users. This seems like a valuable approach for its ability to talk to multiple stakeholders.
 - Interesting process used to develop framework. See Stratton, P. et al (2011)

4.4 Thoughts when moving forward

From the initial review a number of tensions appeared relevant. If some expression of a competency framework for systems thinking in practice (STiP) is systemically desirable and culturally feasible, the framework must remain true to the praxis nature of STiP; where tensions are dealt with as constructive dualities rather than either/or dualisms. The following may be useful prompts of dualities to consider in future design towards professional recognition for systems thinking.

- Process and content? Distinctions between the processes involved in developing a framework and the content of the framework itself and the meaning that might emerge in the relation of the two.
- Planners and 'planned for' (collaborative development)? Differing roles of practitioner organisations, academics and 'clients' in the design and use of the framework
- Rigour and agility? Desire for comprehensiveness of the framework, attempts to present 'rigour' and ease of use/understanding (cf use of visual elements, different expressions for different audiences, length of the documentation, use of formal language)
- Epistemological and ontological use of a 'framework'? Ways in which the framework might be embedded in social context of application, adaptive to changing circumstances or reified according to limited understandings of practice performance
- Opportunities and constraints? The way the framework is 'held' by designers and users – extent to which an appreciation of its limits in governing practice are reflexively incorporated into the framework, its development and use.

5. Findings-2: some initial perspectives (opportunities and challenges)

5.1 Overview

The findings here arise principally from conversations with interviewees as well as other conversations and readings. The findings for both opportunities and challenges are presented in four sub-categories corresponding to particular emphases of the PSFM model of reflective practice as illustrated in Figure 1.

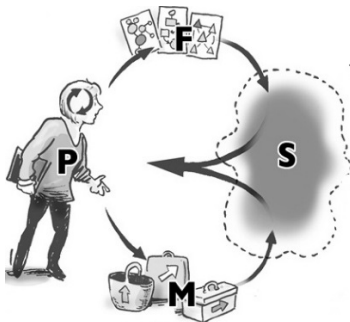


Fig.1 Reflective and Reflexive Practitioner (adapted from Ison, 2010, p.48, which was itself influenced by ideas from Peter Checkland)

The four sub categories relating broadly to the PSFM model of practice comprise (i) 'practitioner and practice related', (ii) 'situation and context related', (iii) 'systems field related' and (iv) 'approach to recognition'.

A final sub-section summarises some possible tensions between opportunities and challenges.

5.2 Opportunities

Practitioner and practice related opportunities

- Provide guidance ('health warning') for protecting STiP practitioners against personal damage arising from applying STiP in workplace.
- 'Bridging the gap' felt by STiP alumni between STiP as learnt and STiP as practiced (cf. eSTeEM report – Reynolds et al., 2016)
- General desire for 'accreditation' of skills and knowledge amongst mainstream professional.
- Professional recognition can mark the territory of or highlight practical skills needed for practitioners who can engage systemically

Situation and context related opportunities

- Widespread awareness that interventions (projects, programmes, policies etc.) are subject to change, uncertainty, and risk (flux of events, people, and ideas...) amenable more to systems thinking support.
- Recognition that people 'out there' were looking for something in systems thinking that would help them deal with intractable or messy issues.
- Increasing sensitivity and attention to ideas of 'systemic failure' through language used in media and politics
- Enable employers to identify value in STiP (creating demand-pull)

Systems field related opportunities

- Maturity of systems field in perceived need to seek out complementarities amongst systems traditions (3rd wave of systems thinking contesting bipolarity of either hard or soft systems)
- Maturity of systems field in seeking out complementarities between systems traditions and existing tools and methods associated with other professional traditions (as expressed by emerging discourse on 4th wave – cf. Midgley and Cabrera)

Opportunities regarding approach to recognition

- Use 'portfolio of evidence approach' which then encourages people to learn practice skills and can then grow practice understanding
- Making the approach to a competency framework aligned with systemic approach would sustain and strengthen the field – adaptive, emergent, valuing interconnections and 'whole in context', open to/ drawing upon multiple perspectives and questions about boundary framing
- Engaging existing professional practice areas to review competency frameworks and assess them for the quality of systemicity or systemic practice that emerges
- The dispersed nature of those offering training in various systems thinking skills and the very practical nature of much of this training suggests that accreditation of these training programmes and the providers could be an alternative approach to professional recognition

5.2 Challenges

Practitioner and practice related challenges

- Risks of shaping STiP into realms of expertocracy
- 'Accreditation' is thin-end of wedge towards destroying vibrancy, dynamism, built-in adaptability nature of STiP

Situational challenges

- A competency framework for individuals fails to deal with the issue of power – those who claim/promise predictability and control get promoted – and draws focus away from the situations that need to be changed (rather than individuals within).

Systems field related challenges

- 'Herding cats' syndrome: too many disparate interests. Dealing with widespread differences in viewpoints regarding what constitutes systems thinking (ranging in views from complexity science to action research traditions). Difficulty in saying what is the minimum set of competencies or core curriculum to be able to claim systemicity of practice.
- Overcrowding of plethora of initiatives on systems thinking competency framework; need for complementarity rather than competition with existing initiatives (perceived role of OU as one of many players in the field)

Challenges regarding approach to recognition

- Difference between being able to show competence and having an impact may be significant in many situations.
- Developing a design model that is systemically desirable (meeting the principles of understanding inter-relationships, engaging with multiple perspectives, and reflective on boundary judgements) whilst being culturally feasible (appropriate for adaptation in wide range of professional traditions)
- Inherently 'unframe-able'. STiP is uniquely different (interdisciplinary/ transdisciplinary). Developing a 'framework' that is true to STiP notions of systems as adaptive purposeful human activities, with a focus on caring for situations of intervention, rather than fixed reified constructs used primarily for accountability

5.3 Thoughts when moving forward

Several core tensions between opportunities and challenges are noted below with particular focus on methodology of generating a competency framework.

- Allowing for the variety in methods and approaches and still having a framework that is practicable.
- Bridging the gap between showing competence (in skills, knowledge and abilities) and the ability to make a difference. Put another way, is a competency framework for systems

thinking the best route to promoting impactful systemic practice amongst a wide range of professionals?

- Accounting for the impact of wider contexts of power, accountability and responsibility when trying to 'recognise' professional competence of individuals.

6. Connecting themes

6.1 Towards a working definition of STiP competence

Etymologically, the root of 'capability' is connected to notions of something that is 'able to hold' or 'receptive'. The root of competency is connected with words that mean 'coincides', 'agrees' or 'fits'. From this point of view, the notion of capability seems to evoke a 'container' metaphor whilst competence has something more like a 'lock and key' metaphor. Competency might be regarded more as a set of agreed protocols for enacting capabilities. STiP competency might be regarded as an expression of STiP 'literacy'.

Ison describes STiP capability as a sub-set of systems literacy which itself is a subset of systemic sensibilities (Ison and Shelly, 2016). Reynolds builds on this by making a distinction between capacity (systemic sensibilities), competence (systems literacy) and STiP capability (Reynolds et al., 2017). The three levels may help to make sense of a potential role of a competency framework for STiP; a framework that might be both systemically desirable and culturally feasible (to borrow language from Checkland, 1985). A competency framework would need to firstly satisfy systemic sensibilities – a range of attributes associated with STiP including attributes of being holistic (sensitive to inter-relatedness), pluralistic (empathetic of different perspectives), and continually adaptive to change and uncertainty. Secondly, a competency framework would need to enable STiP capability to flourish or at least develop in a range of cultural circumstances, including workplace circumstances that may mitigate against STiP (for example, situations where prevailing cultures of target performance management are dominant).

The two strands of study associated with phase 1 reported in sections 4 and 5 above, reveal something of the challenges in a competency framework in both satisfying systemic sensibilities and enabling STiP capabilities. Figure 2 illustrates relevant connections as viewed by Rupesh around three core themes, presented as a sign graph.

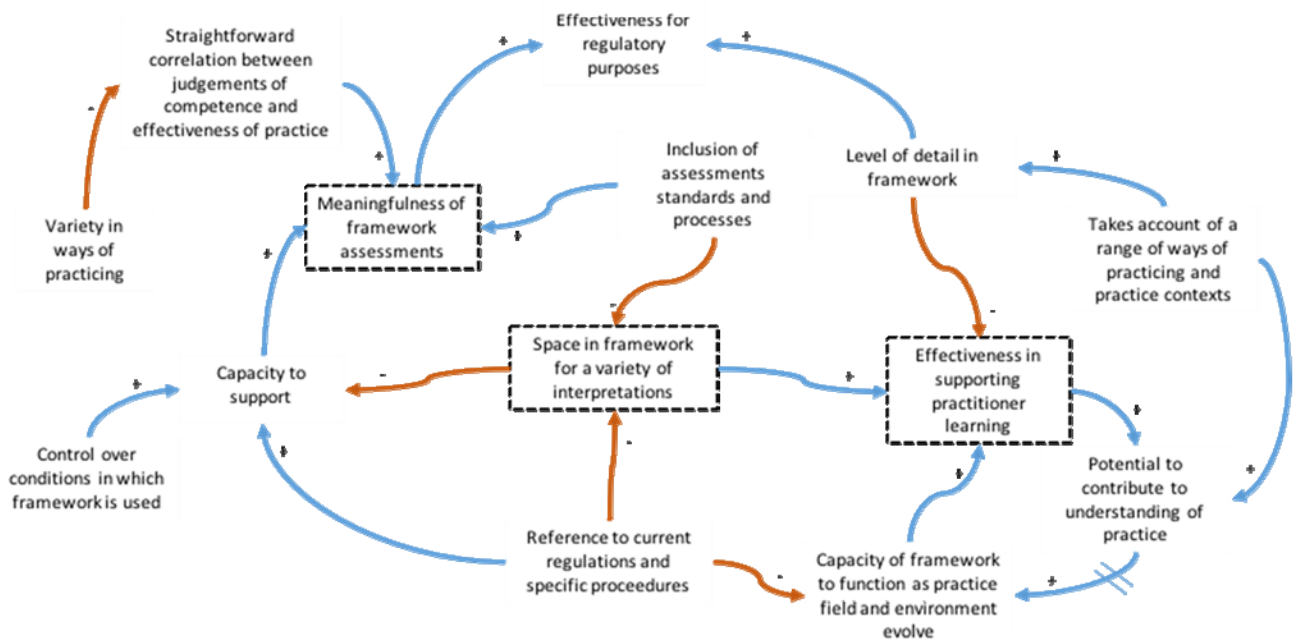


Fig. 2 Competency Framework Development: tensions and trade-offs. Some core connecting themes associated with developing a competency framework for Systems thinking in practice (STiP)
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The notes below are reflections from Rupesh on the three core connecting themes arising from the two strands of study illustrated above.

6.2 Framing for stakeholder accountability ('meaningfulness of framework assessments')

Competency frameworks can be designed to meet a range of different purposes, such as governance, practice development and for external relations. The set of relations amongst various associated factors will lead to various trade offs in practice (see Fig. 2). For example, as the framework includes more assessment standards and processes it is likely to lead to more meaningful assessments and therefore more effective for regulatory purposes. However, the more standards and processes included the less the space in the framework for a variety of interpretations and therefore less effective in supporting practitioner learning.

Similarly, the more the framework includes reference to current regulations and specific procedures and the more the control over conditions in which the framework is used, the more the framework will be able to support objective judgement which will lead to a framework where assessments are more meaningful. That again increases its effectiveness for regulatory purposes. However, the greater the reference to current regulations and specific procedures the less space in the framework for a variety of interpretations and less capacity to function as practice and environment evolve. Both of these increases would lead to reduced effectiveness in supporting practitioner learning.

Elsewhere, the more a framework takes account a range of ways of practicing and practice contexts the more effective it is likely to be in supporting learning; however, here there is a trade off since this is also likely to create a more detailed framework, which whilst on the one hand can support effective regulation also can be less effective for practitioner learning.

Finally, the greater the variety in ways of practicing, the less straightforward the relationship between judgements of competence and effectiveness of practice. The less straightforward this relationship the less meaningful assessments are likely to be and therefore less effective for regulatory purposes. If, following Ison, we understand practice as an emergent property of relations between a practitioner, situation, framework of ideas, and method, then its arguable that in the systems community there is less considerable variety in the ways of practicing.

6.3 Framing for developing practice ('space in framework for unity and interpretation')

One of the major criticisms of the use of competency frameworks in managing professional practice emerges from the conceptualisation of competences embedded in and expressed through the frameworks. It has been suggested that the concept of competency does not address the overall capability through which a practitioner integrates skills, knowledge, qualities, assumptions and worldviews into an embodied and situated performance of practice:

"Furthermore, such approaches produce descriptions of competence, which do not actually capture an individual's ability to accomplish work itself. Two workers may be rated as being equally competent in a range of 9 attributes but may accomplish work differently depending on which attributes they use and how they use them." Wright and Morgan (2012)

In practice situations where there is a limited degree of freedom for practitioner action and the differences in potential outcome are minor then this may not be significant; there may be a relatively simple relationship between the internal attributes needed to perform and the depiction of what might emerge from the situated expression of those skills, knowledge and abilities when practicing. However, where there are a greater degrees of freedom for practitioners in performing tasks and where outcomes of such practice might vary considerably then an assessment of competence will tend towards creating simplistic narratives about the qualities of professional practice that emerge in the real world. This is perhaps most troubling for those who seek to achieve regulatory purposes since the correlation between what might be demonstrated against a competency framework and what might be experienced by stakeholders may be quite fuzzy.

It has been suggested that learning trajectories provide a more useful approach than competences as they 'take into account continuities and discontinuities of learning that result from changes across contexts and over time'.⁵ However, such trajectories are harder to define in objectively measurable ways and therefore restrict the scope for achieving regulation and licensing.

A framework that focuses upon regulation of the profession (by for example, giving detailed assessment standards and focusing upon objective assessment) is likely to work well at the level of capabilities but less likely to function in terms of an appreciation of systemic sensibilities. It might be possible to design a multi-level approach that takes into account these differences and deals with professional recognition differentially according to what is claimed.

⁵ See for example, Eraut and Hirsch (2007), *The significance of workplace learning for individuals, groups and organisations* and Dall'Alba and Sandberg (2006) *Unveiling professional development*.

6.4 Framing for co-learning at the workplace ('effectiveness in supporting practitioner learning')

Designers of competency frameworks tend to give considerable attention to the process of developing content (for example, wide spread use of Delphi method with experts for content development) and to the institutional arrangements for using the frameworks (questions such as who ought to deliver assessment etc.) Generally, this tends to be in situations where it is assumed that the assessment and practice environments are highly controlled and controllable and objectivity in assessment achievable.

Much of the narrative in systems thinking in practice community doesn't assume the possibility of objectivity. There is likely to be more limited control in practice and assessment environments and relatively more concern about the overall difference being made (compared with controlling negative harm).

If so, looking to achieve control through objective assessment of competencies seems less significant than designing a framework whose emergent property is the generation of social learning about systemic practice in evolving organisational and world contexts. The approach would sustain a complex and adaptive system to grow the quality of systems practice through accreditation, shared learning and promotion with a focus upon using the framework as a heuristic device, ie in a formative way for developing practice.

7. Concluding thoughts and future work

The interim report has two broad purposes; firstly, to provide feedback to initial co-respondents kind enough to give their time for conversation in the phase one work (see Acknowledgements for list of contributing participants); and secondly to provide a platform for phase two of the inquiry. Phase two is premised on the notion that despite some of the reservations and concerns expressed about establishing a competency framework, and relayed in-part with this report, there remains an appetite for some enhanced professional recognition of systems thinking in practice (STiP).

The report is part of a wider inquiry on professional recognition of STiP, with the aim of mapping out the beginnings of a competency framework in STiP. The framework is intended to serve both STiP practitioners as *providers*, and commissioners and employers from all sectors (public, private and third sectors including voluntary and other civil agencies) as potential *users* of STiP. The wider aim has three associated objectives.

1. To generate a concise report landscaping national and international endeavours/concerns for embedding systems thinking in practice (STiP) at the workplace, and providing recommendations enabling the OU with other key players to take a significant role in further certifying STiP.
2. To develop a community of practice (CoP) -1: fermenting dialogue through an international set of partnerships including the International Federation of Systems Research (IFSR), with associated social enterprises, building on existing relationships of the Applied Systems Thinking in Practice (ASTiP) group at the School of Engineering and Innovation, including STiP central academics, ALs, an established STiP alumni group, and associated partners, most significantly SCiO (Systems and Complexity in Organizations) and other professional bodies, academic institutions, in co-designing a model or models of STiP competencies that remains true to the core attributes of STiP.
3. To develop a community of practice (CoP) -2: in developing STiP pedagogy arising from recommendations from the eSTeEM report involving a model of pedagogy that involves STiP alumni and workplace employers, as well as ALs and central academics. The core

work here is to continue developing competence (i.e. a systems literacy) with a view of enhancing STiP capability through a partnership of higher education and independent players in the field of STiP.

Phase 1 has modestly made a start with initiating some of these outcomes. Phase 2 can be regarded as a continuation of work already undertaken by Rupesh. Phase 2 will contract one more AL in addition to Rupesh, Jitse Van Ameijde. The two ALs will work in further collaboration with the wider eSTeEM team - including Christine (Blackmore) and Ray (Ison), led by Martin (Reynolds) - to orchestrate (design and facilitate) a workshop and some follow-up reporting and further online sessions. The face-to-face workshop in London invites a selected number of participants for some initial modelling of STiP competency based on outputs of phase 1 and several existing endeavours in the systems thinking community at framing systems thinking competency. The intention in phase 2 is to then orchestrate several online conference sessions (possibly using the OU Live or similar video conferencing platform) involving key STiP players in the field – including amongst others - those who participated in phase 1, to test the relevance of modelling for systems thinking in practice competency as suggested through the workshop.

Meanwhile, responses to this interim report directed to either Rupesh and/or Martin are very welcome (see footnote 1 for contact details).

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References

- Checkland, P. (1985). Achieving 'desirable and feasible' change: an application of soft systems methodology. *Journal of the Operational Research Society*, 36(9), 821-831.
- Dall'Alba, G., & Sandberg, J. (2006). Unveiling professional development: A critical review of stage models. *Review of educational research*, 76(3), 383-412.
- Eraut, M., & Hirsch, W. (2007). The Significance of Workplace Learning for Individuals. *Groups and Organisations*.
- Eoyang, G. (2009) *Practicing Organization Development: A Guide for Leading Change: A Third Edition*

- Ison, R., (2010). *Systems practice: how to act in a climate change world*. Springer Science & Business Media. London
- Ison, R. and Shelley, M., (2016). Governing in the Anthropocene: Contributions from Systems Thinking in Practice?. *Systems Research and Behavioral Science*, 33(5), pp.589-594.
- Reynolds, M; Shah, R; Wedlock, E; Ison, R and Blackmore, C .(2016). *Enhancing Systems Thinking in Practice at the Workplace: eSTeEM final report*. The OU Centre for STEM Pedagogy. The Open University. <http://oro.open.ac.uk/47797/>
- Reynolds, M., Blackmore, C ., Ison, R., Shah, R. and Wedlock, E. (2017 in Press) The role of systems thinking in the practice of implementing sustainable development goals *in* :Walter Leal Filho (ed.) *Handbook of Sustainability Science and Research* Springer Science & Business Media. London
- Stratton, P., Reibstein, J., Lask, J., Singh, R., & Asen, E. (2011). Competences and occupational standards for systemic family and couples therapy. *Journal of Family Therapy*, 33(2), 123-143.
- Wright, D and Morgan,L (2012) An Independent Evaluation of Framework for Professional Development in Pharmacy. Report of the MPC Workstream 2 Project: Independent evaluation of competency frameworks within pharmacy education in the UK. University of East Anglia

Further References

(sources of insight regarding content of competency frameworks)

- Benson, T. (nd) Developing a Systems Thinking Capacity in Learners of all Ages. <http://www.watersfoundation.org/webbed/library/articles/Developing-ST-capacity.pdf>
- Birney, A (2014) *Cultivating System Change: A practitioner companion*. Do Publishers
- Boulton, J. G., Allen, P.M. and Bowman, C. (2016) *Embracing Complexity: Strategic Perspectives for an Age of Turbulence*. Oxford University Press
- Burnell, D. (2015) Systems Thinking Orientation Assessment Framework (STOAF): Towards Identifying the Key Characteristics of the Systems Thinker and Understanding Their Prevalence in the Layperson. *Systems Research and Behavioral Science*. Volume 33, Issue 3, pages 471–482, May/June 2016
- Conley (2015) Core Competencies of Design: the basis of a broadly applicable discipline. Conference Paper at ISSS Berlin 2015
- Frank, M. (2012) Engineering Systems Thinking: Cognitive Competencies of Successful Systems Engineers. *Procedia Computer Science* 8. Pp 273- 278.
- Frank J.R., Mungroo R., Ahmad Y., Wang M., De Rossi S., Horsley T. (2010) Toward a definition of competency-based education in medicine: a systematic review of published definitions. *Medical Teacher* 32 (8) 631-637.
- Gharajedaghi, J. (2005) *Systems Thinking: Managing Chaos and Complexity*
- Gonczi, A., 1994. Competency based assessment in the professions in Australia. *Assessment in Education* 1 (1), 27–44
- Immediato (2011) Enhancing the Next Generation of Systems Thinkers: an interview with Tracy Benson. *Reflectons* 10(4) 13-22

- Jones, J., Bosch, O., Drack, M., Horiuchi, Y., and Ramage, M. (2009). On the design of systems-oriented university curricula. *The Research Reports of Shibaura Institute of Technology (Social Sciences and Humanities)*, 43(1) pp. 121–130.
- Kubaneck, (2002) System Dynamics Certification and/or Accreditation
<http://www.systemdynamics.org/FeasibilityOfCertification.htm>
- Lester, S (2014) Professional Competence Standards and frameworks in the United Kingdom. *Assessment and Evaluation in Higher Education* 39(1) 38- 52.
- Linard, K.T. And Aretz, B. (2000) Systems Thinking Competencies and the Learning Organisation. 1st International Conference on Systems Thinking In Management
- Marshall, J. (2001). Self-Reflective Inquiry Practices. In P. Reason & H. Bradbury (Eds.), *Handbook of action research: Participative Inquiry and Practice* (pp. 433-439). London: Sage Publications
- Midgley G. Four domains of complexity. *Emergence: Complexity and Organization*. 2016 Jun 30 [last modified: 2016 Aug 21]. doi: 10.emerg/10.17357.6ffd4f1cee07b1eab0d5e11f6522261b.
- Nazari, M. and Khandan, N. (2012) *Stories for Teaching Systems Thinking: Development and Implementation Guide*. Sharif University of Technology, Tehran
- Shah, K., Naidoo, K. and Loughman, J. (2015) Development of socially responsive competency frameworks for ophthalmic technicians and optometrists in Mozambique. *Clinical and Experimental Optometry* 99 (2) 173 - 182
- Stratton, P. Reibstein, J., Lask, J., Singh, R., & Asen, E. (2011) Competences and occupational standards for systemic family and couples therapy. *Journal of Family Therapy*. 33: 123–143).
- Strumpf, J and Ryan, T. (1994) Experiences in Teaching Systems Thinking. *International System Dynamics Conference* 1994
- Sweeney, L.B. and Sterman, J. (2000) Bathtub dynamics: initial results of a systems thinking inventory. *System Dynamics Review* 16 (4) 2000.
- Thibodeau, P.H., McPherson Frantz, C. and Stroink, M. L. (2016) Situating a Measure of Systems Thinking in a Landscape of Psychological Constructs, *Systems Research and Behavioral Science* (33) 4
- Torbert, W. R. (2001). The Practice of Action Inquiry. In P. Reason & H. Bradbury (Eds.), *The Handbook of Action Research: Participative Inquiry and Practice* (pp. 250-260). London: Sage Publications.

Endnotes: Online references to phase 1 findings (sections 4 and 5)

i

⌈ <http://onlinelibrary.wiley.com/doi/10.1002/sdr.1550/full>

ii

⌈ <http://www.crrglobal.com/>

iii

┐
https://ssir.org/articles/entry/the_dawn_of_system_leadership?utm_source=Enews&utm_medium=Email&utm_campaign=SSIR_Now&utm_content=Title

iv

┐ <https://www.forumforthefuture.org/our-work/hub/system-innovation>

v

┐ http://www.incoseonline.org.uk/Normal_Files/WhatIs/Systems_Thinking.aspx?CatID=What_Is_SE

vi

┐ <https://www.linkedin.com/groups/2639211/2639211-6171736884503420932>

vii

┐ <http://rlfonline.com/>

viii

┐ <http://www.scio.org.uk/>

ix

┐ <http://www.triarchypress.net/9-themes---systemic-leadership-toolkit.html> and
<http://www.systemicleadershipinstitute.org/>

x

┐ <http://www.systemswiki.org/>

xi

┐ <http://watersfoundation.org/systems-thinking/habits-of-a-systems-thinker/>

xii

┐ <http://appliedimprovisation.network/>

xiii

┐ <https://participatoryartslearning.wordpress.com/>

xiv

┐ <http://www.eagt.org/pcqs/PC&QS%20-%20competencies.pdf>

xv

┐ <https://www.iaf-world.org/site/professional/core-competencies>

xvi

┐ https://www.ucl.ac.uk/pals/research/cehp/research-groups/core/competence-frameworks/Systemic_Therapy

